operation of the conveyor system at any state of operation other than start-up and shut-down of the system.

An additional feature obtainable with the combination of the drive controller **80** and the electromagnetic drive **40** is the capability of maintaining any suitable operating point on the stroke distance curve. In addition, even operating points on the left side of the resonance point **302** can be maintained by increasing the amplitude to compensate for decreased movement of the product which avoids product buildup on the conveying member **20**, and hence catastrophic failure.

A further feature of the drive controller **80** and the drive **40** is its ability to seek out and maintain a maximum stroke distance at resonance mode. The frequency of the controller is initially decreased slowly while the stroke distance of the pan increases. A sensor **85** senses the stroke distance and when the stroke distance starts to decrease the system then knows it has just moved past resonance to the left. Then the controller increases the drive frequency which again increases the stroke distance. When the stroke distance starts to decrease then the system knows it has moved past the resonance point **302** to the right. In this manner, the conveying system **10** can maintain itself at, or near resonance, which reduces power consumption and maximizes the stroke distance. This also reduces the size of the electromagnetic drive **40** necessary to operate the system **10**. Further, because of the controllability of the system **20**, the system **10** may be designed with an operating point much closer, or at resonance. Also, when additional product is added to the pan, the stroke distance can be maintained at a desirable operating point or distance thereby preventing catastrophic failure which would result without such controllability.

Over time during operation of the conveyor system **10** the spring constants tend to change which changes the operating point of the conveyor system **10**. Likewise, the system **10** automatically compensates for such changes and can operate at any desired frequency.

Referring to FIG. **10**, an alternative embodiment of the electromagnetic drive **40** is a C-shaped magnetically permeable member **250** wound with wire **252** that pulls and/or pushes an armature **254** connected to the counterweight **70**. Any other suitable electromagnetic drive may be used.

In addition, if a spring breaks, the system can detect the difference in stroking distance, the same as a change in product mass, and compensate accordingly thus preventing catastrophic failure.

Referring to FIG. **8**, for large or longer conveyor systems where additional force is required than obtainable with a single vibratory drive, a plurality of vibratory drives **40** may be connected to the frame. In such a case the vibratory electromagnetic drives **40** are preferably arranged equal distant on either side and parallel to the line of force **42**. The electromagnetic drives may be different distances from the line of force **42** if the forces provided by the respective drives compensate for the different location that the forces are applied to the conveyor system so that the frame remains stationary and the conveyor system does not undergo significant rocking motion. In addition, it may be more cost effective to use more than one electromagnetic drive than a single large electromagnetic drive. The drive controller **80**

maintains the drives in phase by varying the magnitude and frequency of the supplied current. It is exceedingly difficult to maintain a plurality of counter rotating mass drives in phase, especially if the frequency of the drive is changed.

Referring to FIG. **9**, to extend the length of the conveyor system it is more advantageous in many circumstances to employ multiple conveyor systems aligned with one another providing matching vibratory motions. With electromagnetic drives and one or more controllers, as opposed to counter rotating mass drives, it is feasible to maintain the conveyor pans such that they do not result in striking one another. This is especially important because the adjacent conveyor pans are very close to one another.

The terms and expressions which have been employed in the foregoing specification are used therein as terms of description and not of limitation, and there is no intention, in the use of such terms and expressions, of excluding equivalents of the features shown and described or portions thereof, it being recognized that the scope of the invention is defined and limited only by the claims which follow.

What is claimed is:

1. A conveying system comprising:

(a) a frame supporting a conveying member suitable to move products thereon;

(b) a drive maintaining said frame substantially stationary while said conveying member is moving said products thereon;

(c) a sensor that senses a vibratory motion of said conveying member; and

(d) said drive connected to said frame to provide a force to said frame in response to said sensor to maintain a substantially constant stroke distance of said conveying member while at least one of the total mass of said products supported by said conveying member is increasing, the total mass of said products supported by said conveying member is decreasing, and spring constants of springs interconnecting said frame to said conveying member change.

2. The conveying system of claim **1** wherein said drive is an electromagnetic drive having a mass that vibrates back and forth along a substantially straight path.

3. A conveying system comprising:

(a) a frame supporting a conveying member suitable to move products thereon;

(b) a drive connected to said frame to provide a force to said frame to move said conveying member in a vibrating motion;

(c) said drive maintaining said frame substantially stationary while said conveying member is moving said products thereon; and

(d) a sensor that senses said vibrating motion and regulates said drive to change the stroke distance of said conveying member.

4. The conveying system of claim **3** wherein said drive is an electromagnetic drive having a mass that vibrates back and forth along a substantially straight path.

*   *   *   *   *